

Load Balancing Using iBGP Routing



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Mikrotik User Meeting

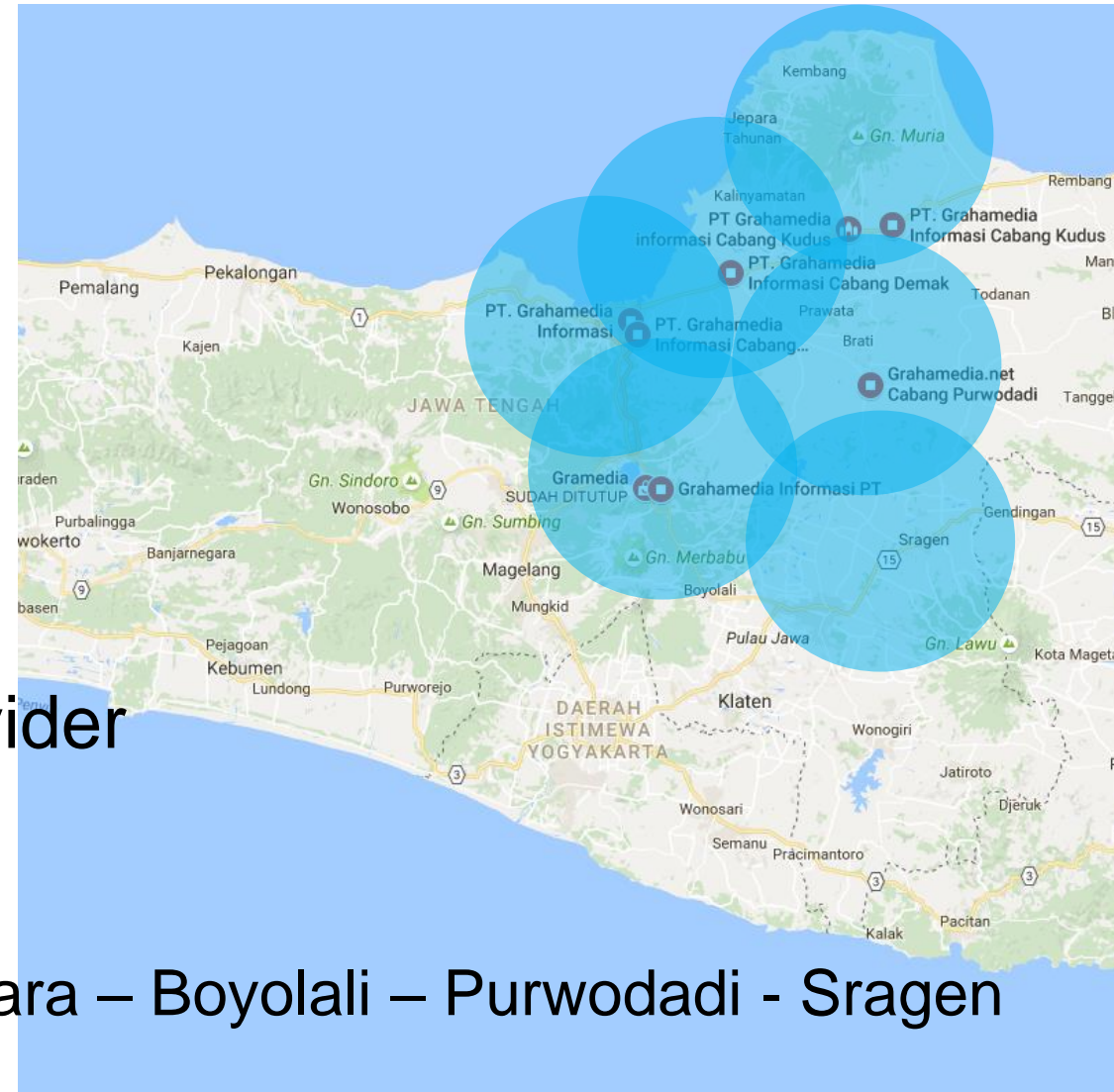
Yogyakarta – Indonesia

2017

About Presenter

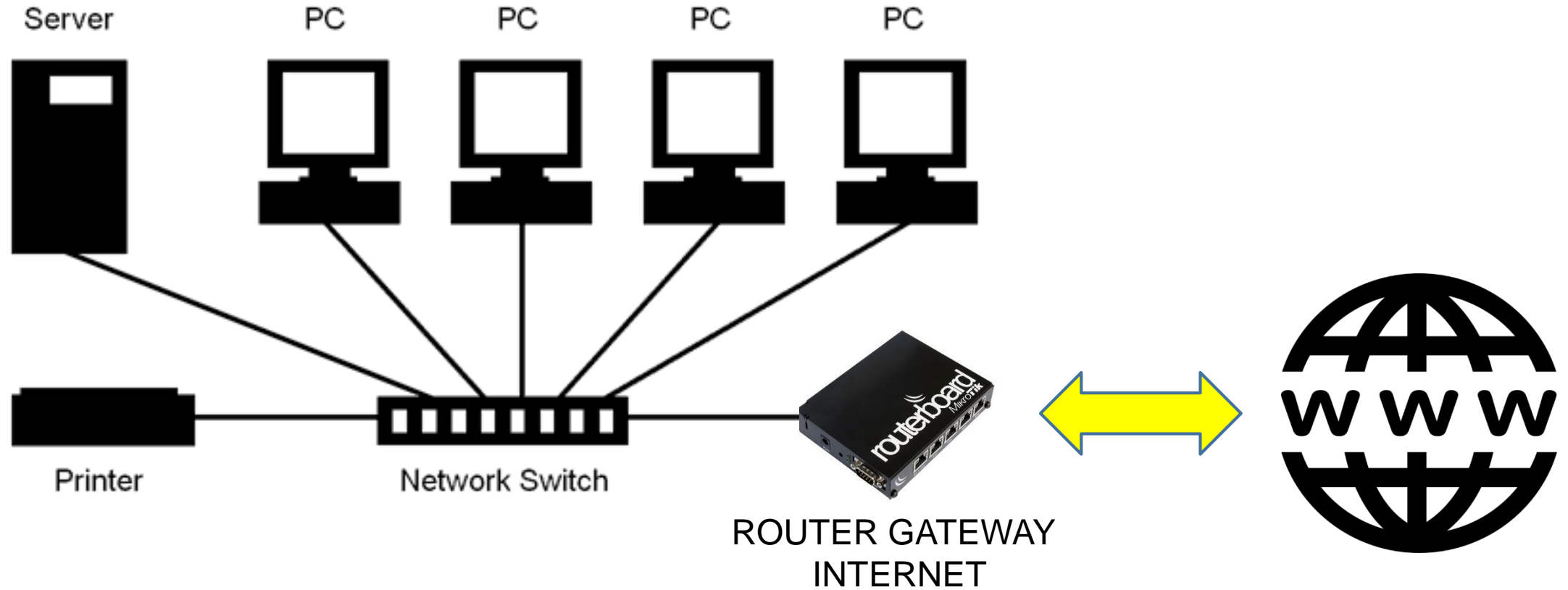
- Irvan Adrian Kristiono
- MTCNA, MTCRE, MTCWE, MTCINE
- Mikrotik Certified Trainer
- Central Network
 - Training Center & IT System Integrator
 - <http://www.centralnetwork.net>
- Grahamedia.Net Internet Service Provider
 - <http://www.grahamedia.net.id>
- Lokasi kami di Jawa Tengah

Salatiga – Semarang – Demak – Kudus – Jepara – Boyolali – Purwodadi - Sragen

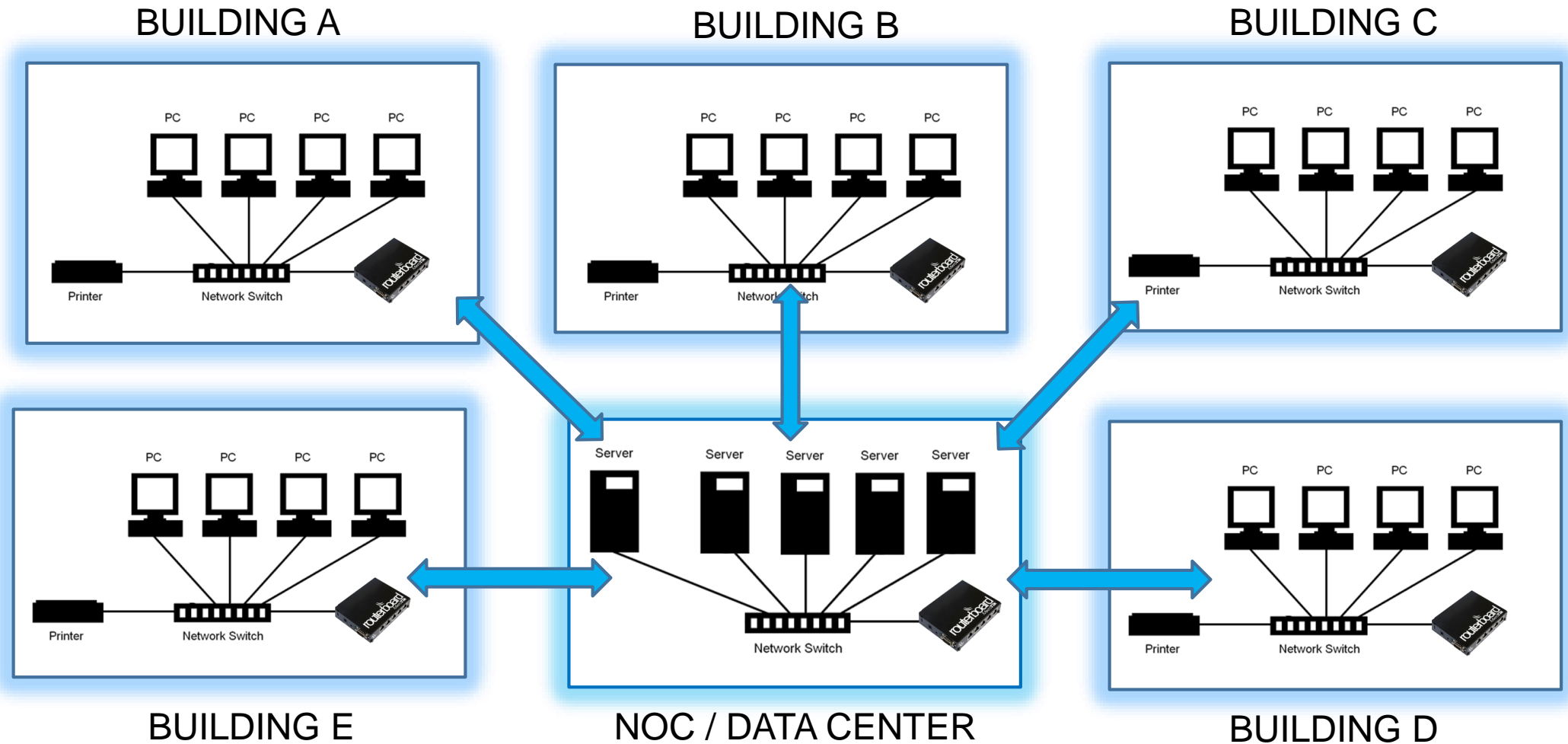


LOAD BALANCING

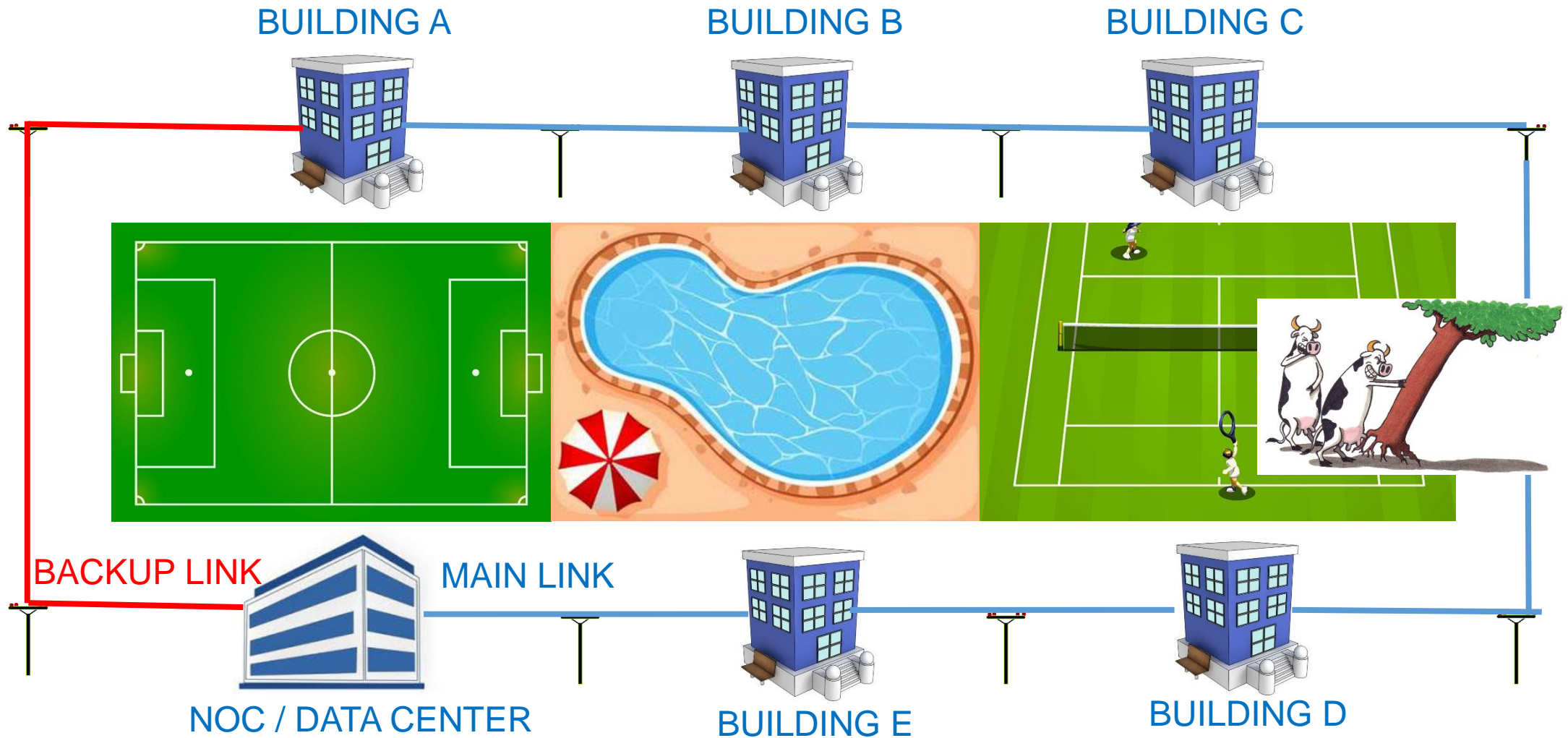
SIMPLE NETWORK LAN



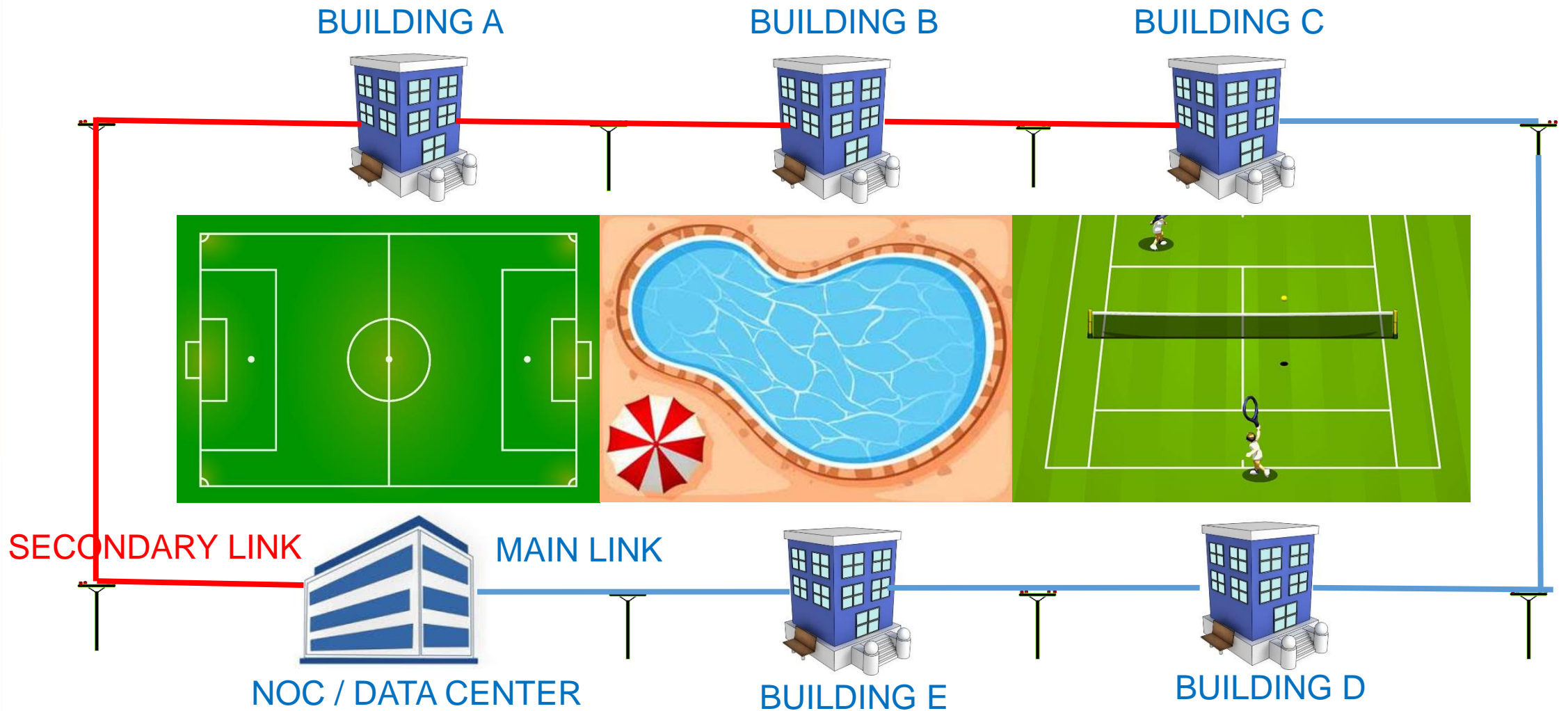
MULTIPLE LAN CONNECTION - STAR



BUS NETWORK

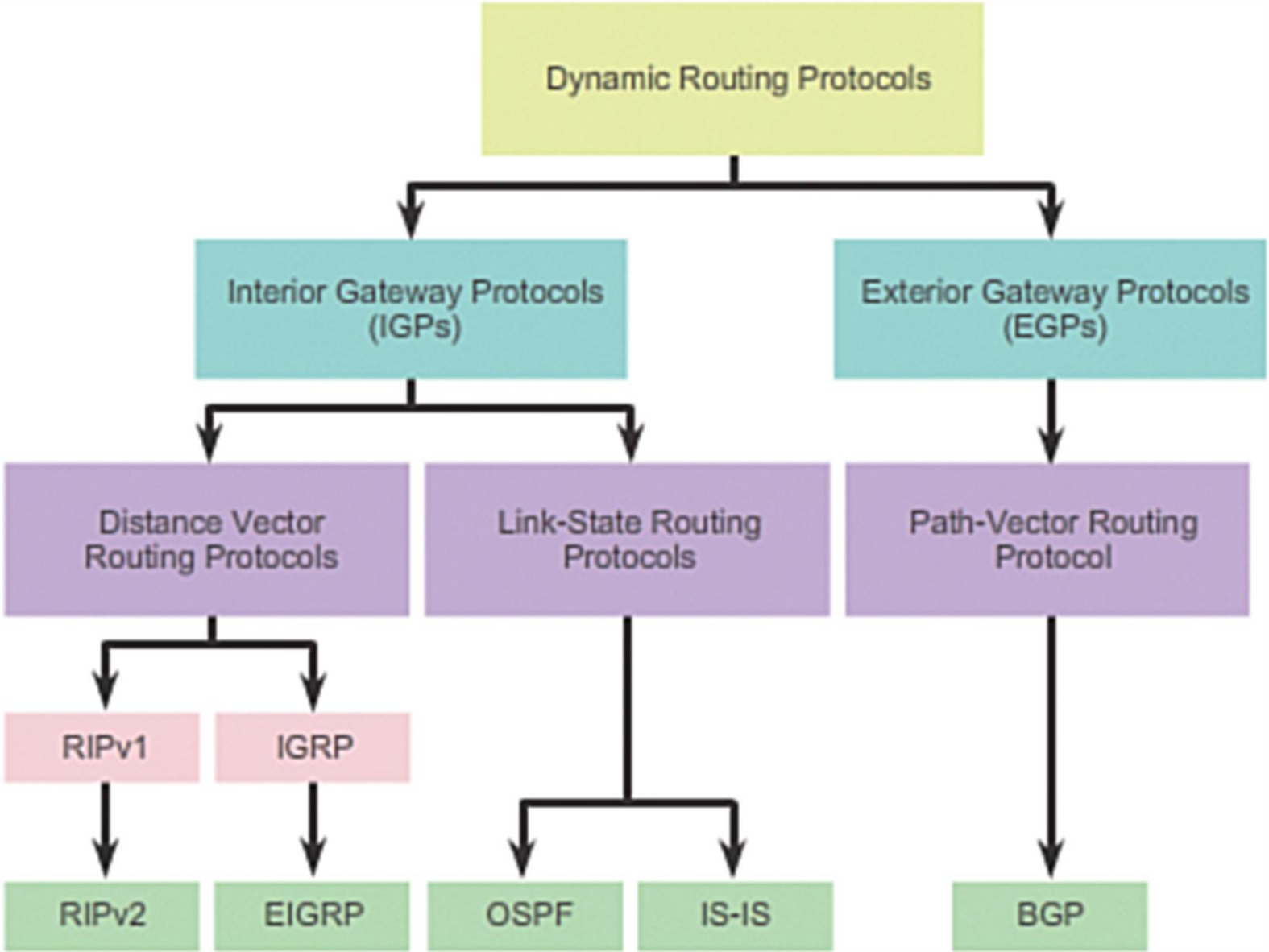


LOAD BALANCING – BUS NETWORK

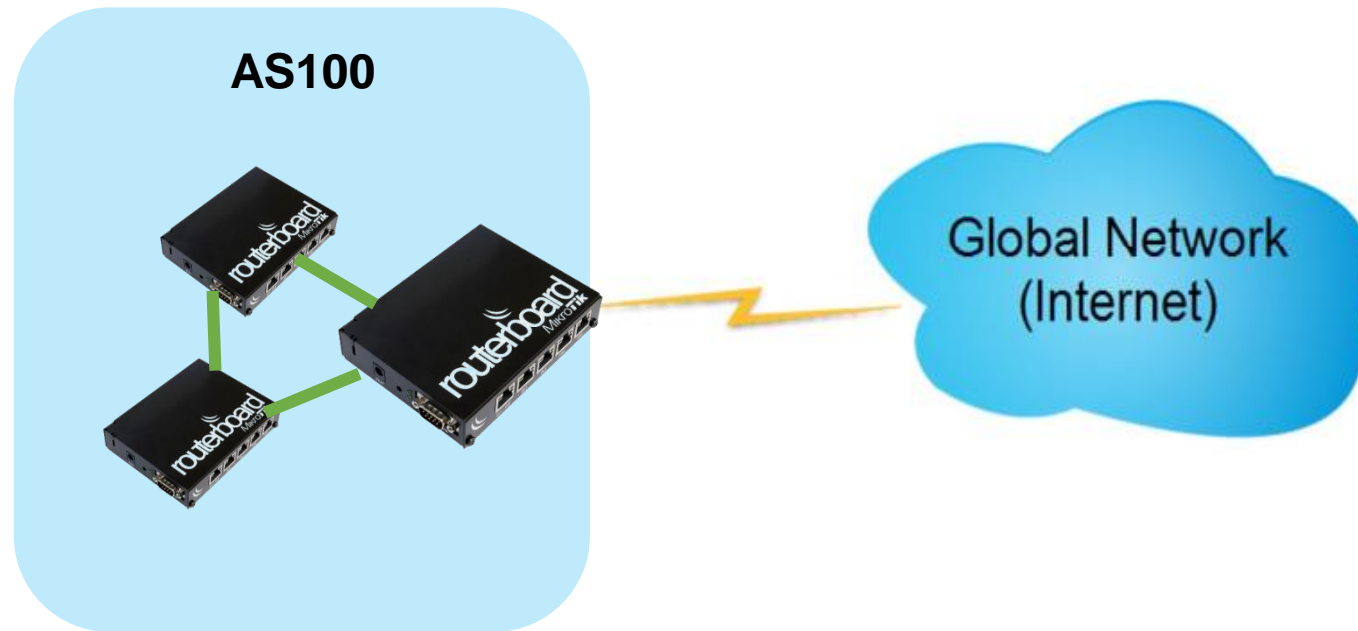


DYNAMIC ROUTING

DYNAMIC ROUTING

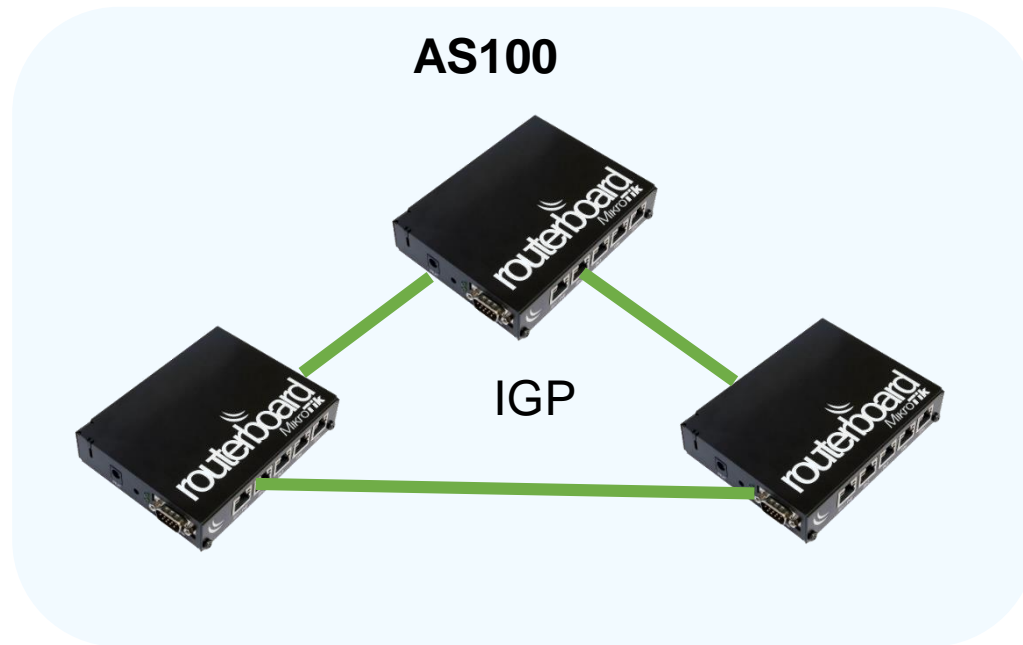


AUTONOMOUS SYSTEM



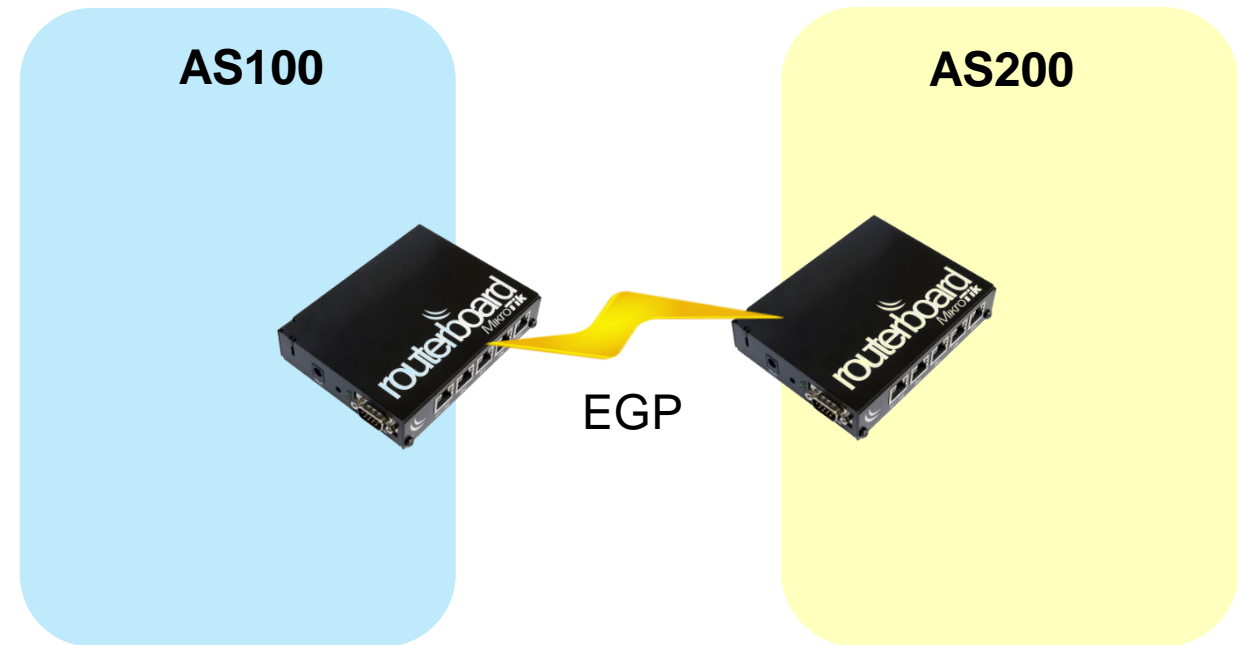
DYNAMIC ROUTING

- INTERIOR GATEWAY PROTOCOL



- RIP, OSPF

- EXTERIOR GATEWAY PROTOCOL



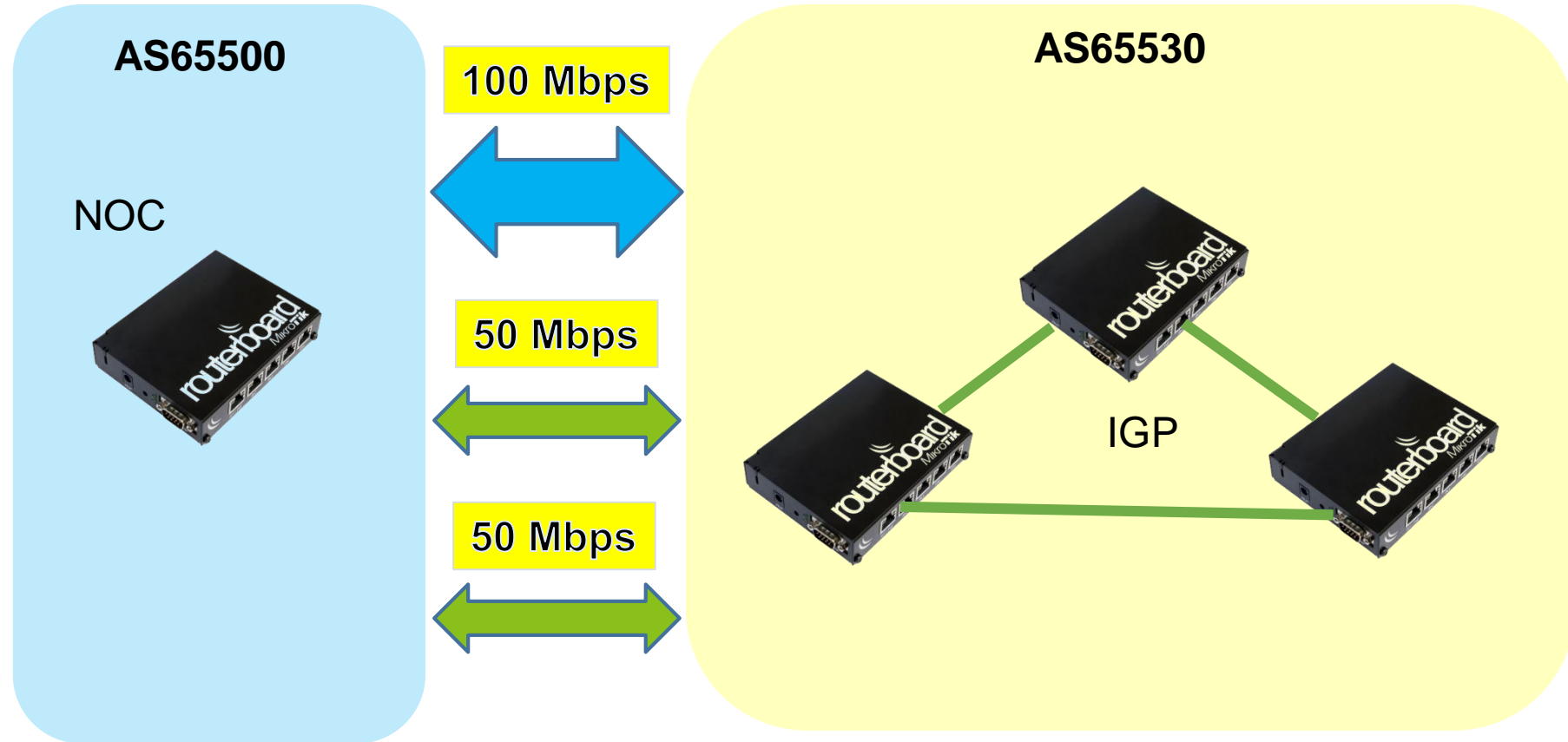
- BGP

Default Administrative Distance

Route Source	Distance
Connected Interface	0
Static Route	1
Enhanced IGRP Summary Route	5
External BGP	20
Internal Enhanced IGRP	90
IGRP	100
OSPF	110
IS-IS	115
RIP	120
EGP	140
External Enhanced IGRP	170
Internal BGP	200
Unknown	255

Why iBGP ?

MAIN CAPACITY \neq SECONDARY CAPACITY



INTERNAL BGP (iBGP)

- Antar Router tidak perlu terkoneksi langsung (Directly Connected)
- **iBGP harus terkoneksi Full Mesh :**
 - Membantu Remote Network menggunakan Best Path
 - Redundant koneksi diantara peer Internal
- iBGP peer tidak meng Advertise kembali Network yang dipelajari dari peer internal lainnya.
(harus menggunakan eBGP peer)
- **iBGP akan menjadi penentu keputusan external peer mana yang digunakan untuk mencapai remote network**

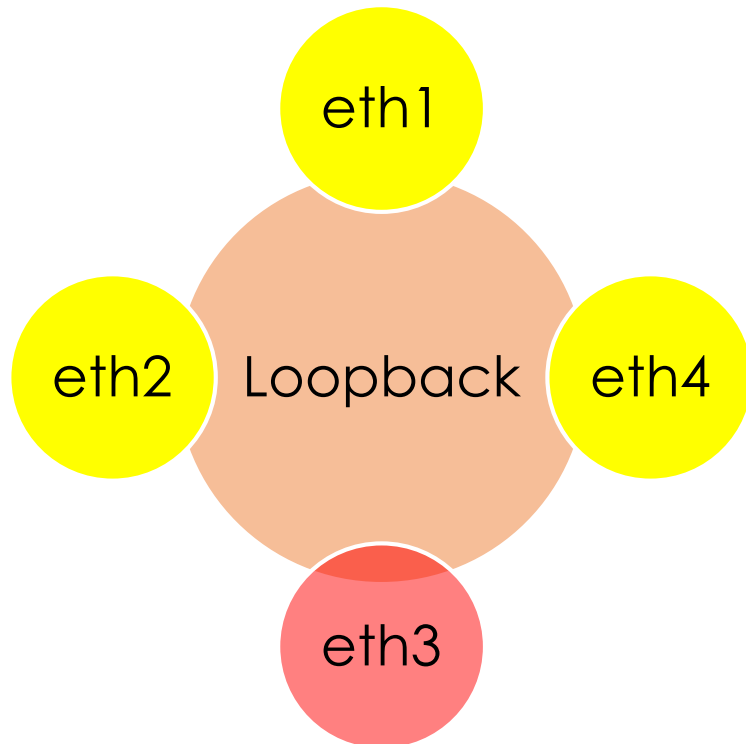
IP iBGP Peering

- Peering dengan menggunakan IP Address disalah satu interface, menyebabkan ketergantungan terhadap salah satu link fisik.
- Jika link tersebut putus, Peer iBGP akan down, IP akan tidak teradvertise.
- Untuk fail over peering antar router iBGP, harus menggunakan IP Loopback

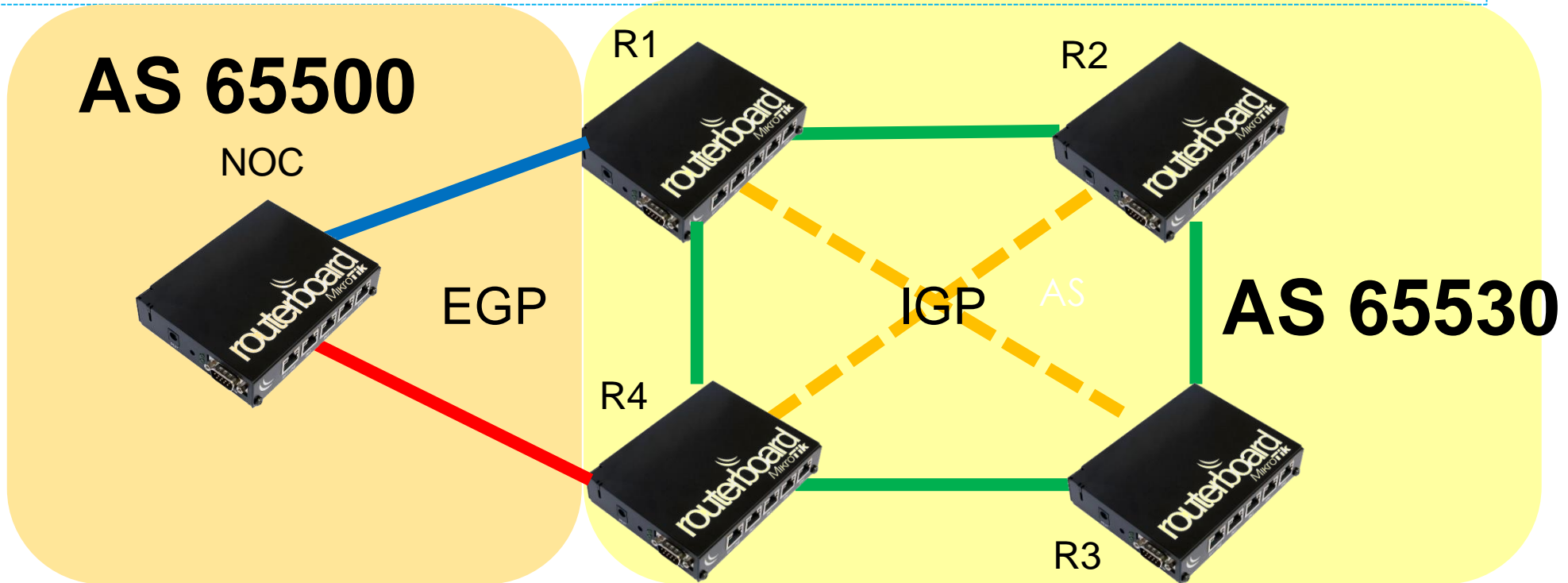
LOOP BACK

- iBGP dan OSPF menggunakan Alamat IP loopback untuk interkoneksi antar peer, mengapa ?

Karena Interface Loopback tidak akan down

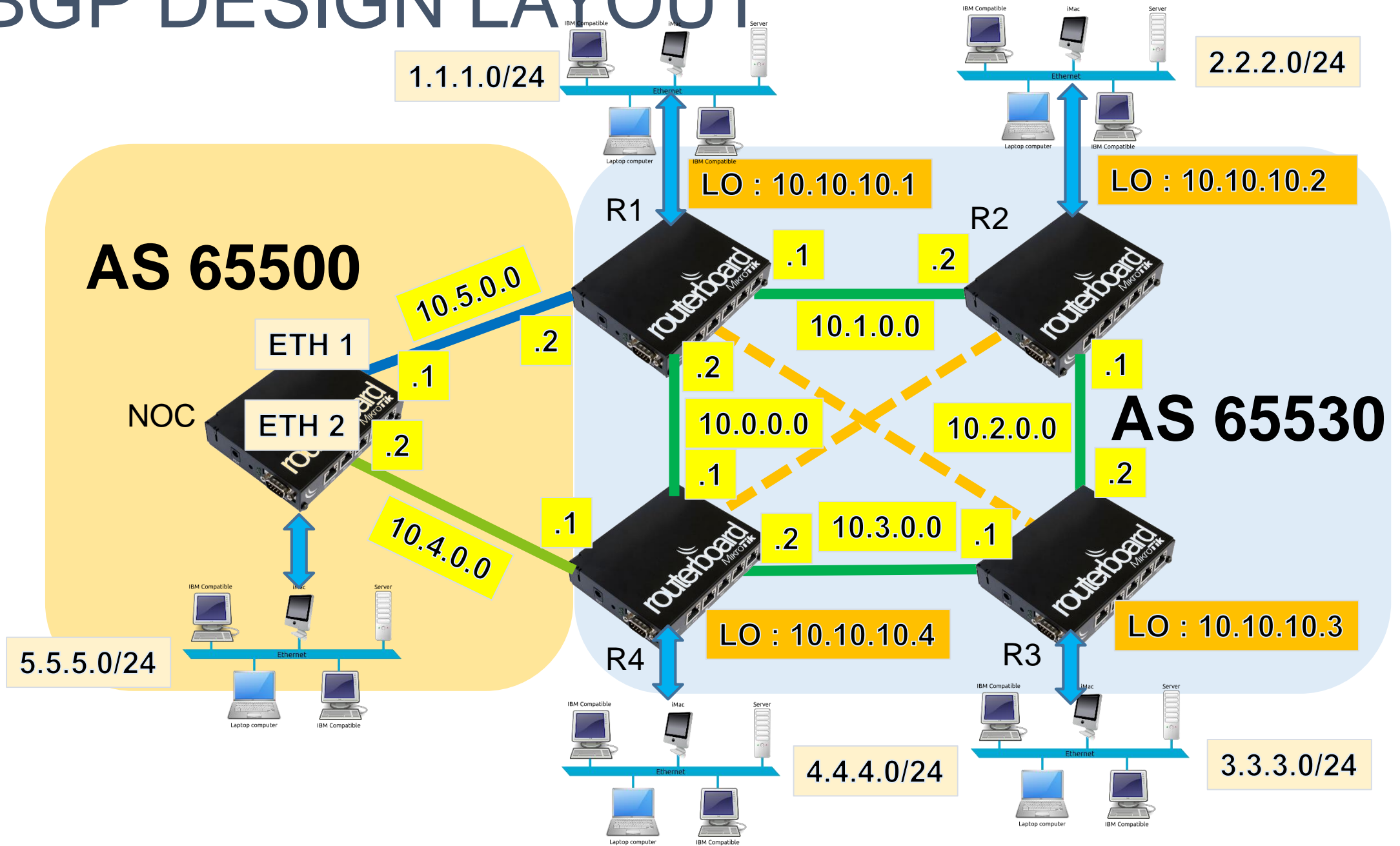


iBGP Design Plan



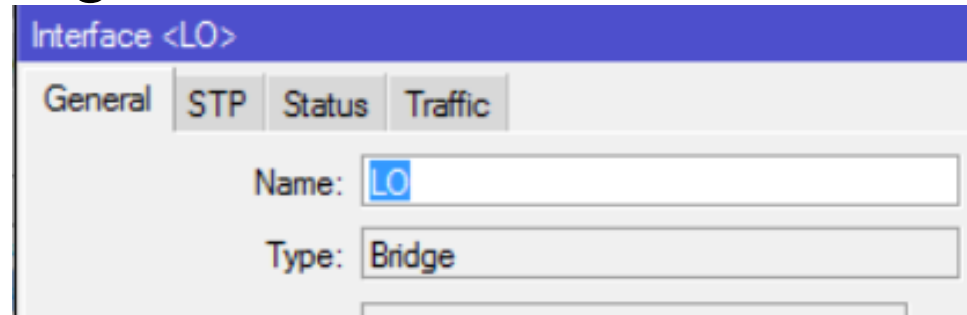
- Full Mesh Peer dalam 1 ASN
- Menggunakan OSPF sebagai IGP
- iBGP untuk memilih Best Path untuk akses ke Internet / Data Center

iBGP DESIGN LAYOUT

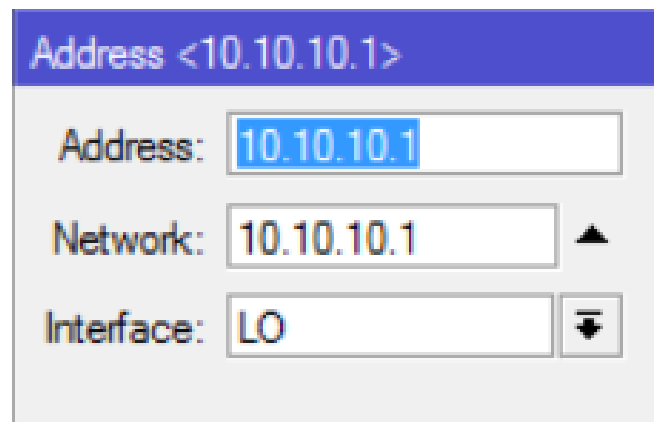


SETUP LOOPBACK INTERFACE

- Buat interface “bridge-LO”



- Tambahkan IP Loopback di “bridge-LO”



INSTALL OSPF (IGP)

OSPF Instance <default>

General Metrics MPLS Status

Name:

Router ID:

OSPF

Instances Networks Areas Area Ranges Virtual Links Neighbors

+ - ✓ ✗ [icon] [filter]

Network	Area
10.1.0.0/30	backbone
10.4.0.0/30	backbone
10.10.10.1	backbone

OSPF

Virtual Links Neighbors NBMA Neighbors Sham Links LSA Routes AS Border Routers ...

[filter]

Instance	Router ID	Address	Interface	State Changes
default	10.10.10.2	10.1.0.2	ether1	6



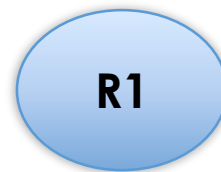
INSTALL iBGP

BGP Instance <default>

Name:

AS:

Router ID:



BGP

Instances VRFs Peers Networks Aggregates VPN4 Routes Advertisements

+ - ✓ ✗ 🗑️ 🏠 Refresh Refresh All Resend Resend All

Name	Instance	Remote Address	Remote AS	M...	R...	TTL	Remote ID	Uptime	Prefix Co...	State
🌐 NOC	default	10.5.0.1	65500	no	no	d...	10.10.10.5	00:00:04	5	established
🌐 R2	default	10.10.10.2	65530	no	no	d...	10.10.10.2	00:06:01	5	established
🌐 R3	default	10.10.10.3	65530	no	no	d...	10.10.10.3	00:05:50	5	established
🌐 R4	default	10.10.10.4	65530	no	no	d...	10.10.10.4	00:05:54	7	established



IP ROUTE

Route List

Routes	Nexthops	Rules	VRF
DAb	▶ 1.1.1.0/24	10.10.10.1 recursive via 10.2.0.1 ether2	
DAb	▶ 2.2.2.0/24	10.10.10.2 recursive via 10.2.0.1 ether2	
DAC	▶ 3.3.3.0/24	LAN reachable	
DAb	▶ 4.4.4.0/24	10.10.10.4 recursive via 10.3.0.2 ether1	
DAb	▶ 5.5.5.0/24	10.10.10.1 recursive via 10.2.0.1 ether2	
Db	▶ 5.5.5.0/24	10.10.10.4 recursive via 10.3.0.2 ether1	
Db	▶ 10.0.0.0/24	10.10.10.2 recursive via 10.2.0.1 ether2	

R3

Main

Backup

Route List

Routes	Nexthops	Rules	VRF
Db	▶ 1.1.1.0/24	10.4.0.1 reachable ether2	
DAb	▶ 1.1.1.0/24	10.5.0.2 reachable ether1	
DAb	▶ 2.2.2.0/24	10.5.0.2 reachable ether1	
Db	▶ 2.2.2.0/24	10.4.0.1 reachable ether2	
DAb	▶ 3.3.3.0/24	10.4.0.1 reachable ether2	
Db	▶ 3.3.3.0/24	10.5.0.2 reachable ether1	
Db	▶ 4.4.4.0/24	10.4.0.1 reachable ether2	
DAb	▶ 4.4.4.0/24	10.5.0.2 reachable ether1	
DAC	▶ 5.5.5.0/24	ether3 reachable	

NOC

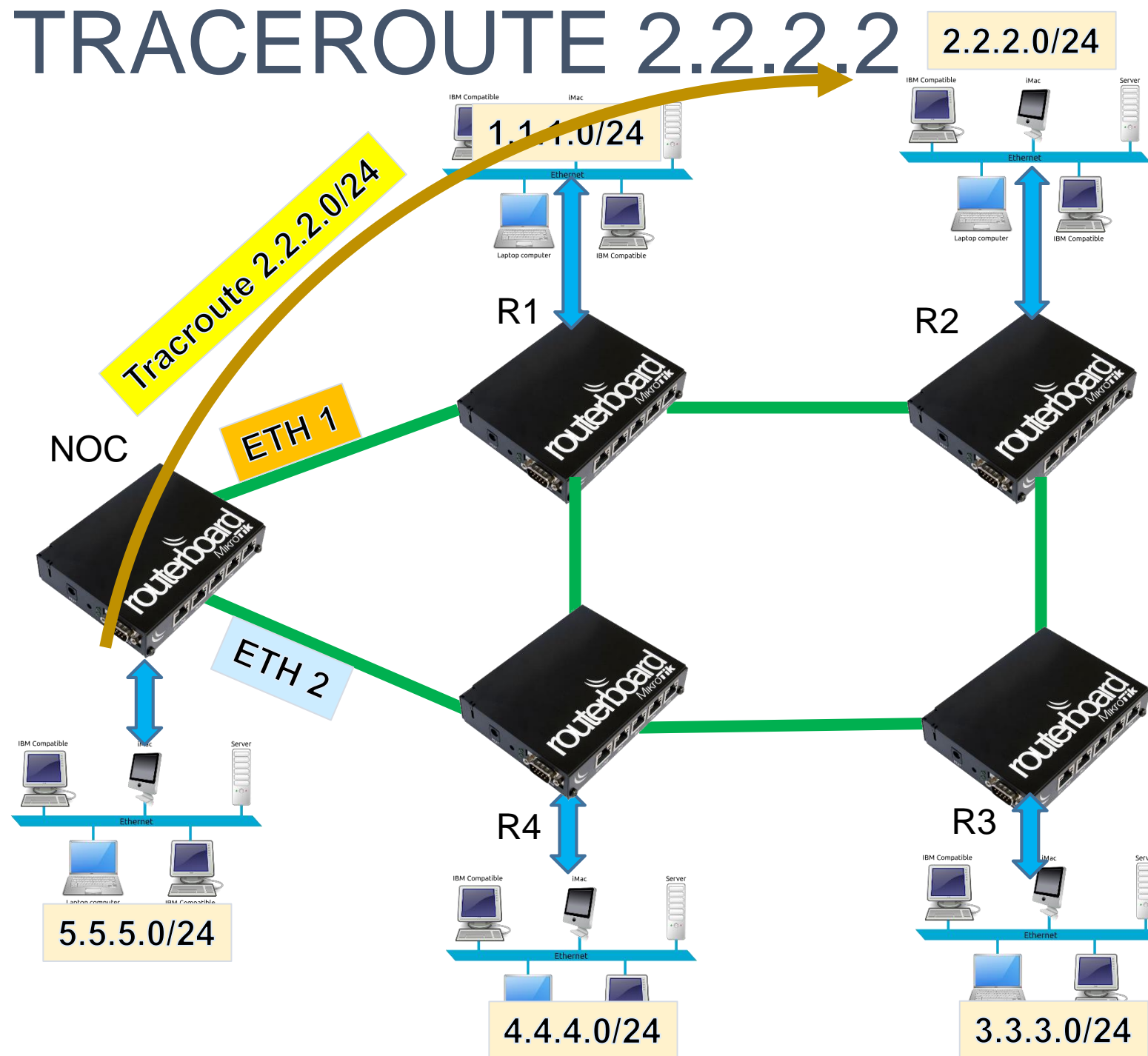
Main

Backup

Main

Backup

TEST TRACEROUTE 2.2.2.2



2.2.2 via ether1, Cara ubah via ether2 ?

The image displays two screenshots from a network management interface. The top screenshot, titled "Route List", shows a table of routes. The bottom screenshot, titled "Interface List", shows a table of network interfaces. A diagram between the screenshots illustrates traffic flow from a "NOC" source to two destinations, "Main" and "Backup".

Route List

	Dst. Address	Gateway
Db	1.1.1.0/24	10.4.0.1 reachable ether2
DAb	1.1.1.0/24	10.5.0.2 reachable ether1
DAb	2.2.2.0/24	10.5.0.2 reachable ether1
Db	2.2.2.0/24	10.4.0.1 reachable ether2
DAb	3.3.3.0/24	10.4.0.1 reachable ether2
Db	3.3.3.0/24	10.5.0.2 reachable ether1
Db	4.4.4.0/24	10.4.0.1 reachable ether2
DAb	4.4.4.0/24	10.5.0.2 reachable ether1
DAC	5.5.5.0/24	ether3 reachable

Interface List

Interface	Name	Type	Actual MTU	L2 MTU	Tx	Rx	Tx Pack
R	LAN	Bridge	1500	65535	0 bps	0 bps	
R	LO	Bridge	1500	65535	0 bps	0 bps	
R	ether1	Ethernet	1500	1598	54.7 Mbps	54.1 Mbps	
R	ether2	Ethernet	1500	1598	0 bps	0 bps	

Diagram: A blue oval labeled "NOC" has two arrows pointing to the right. The top arrow is black and points to a box labeled "Main". The bottom arrow is blue and points to a box labeled "Backup".

TEST TRACEROUTE 2.2.2.2

2.2.2.0/24

1.1.1.0/24

NOC

ETH 1

ETH 2

5.5.5.0/24

R4

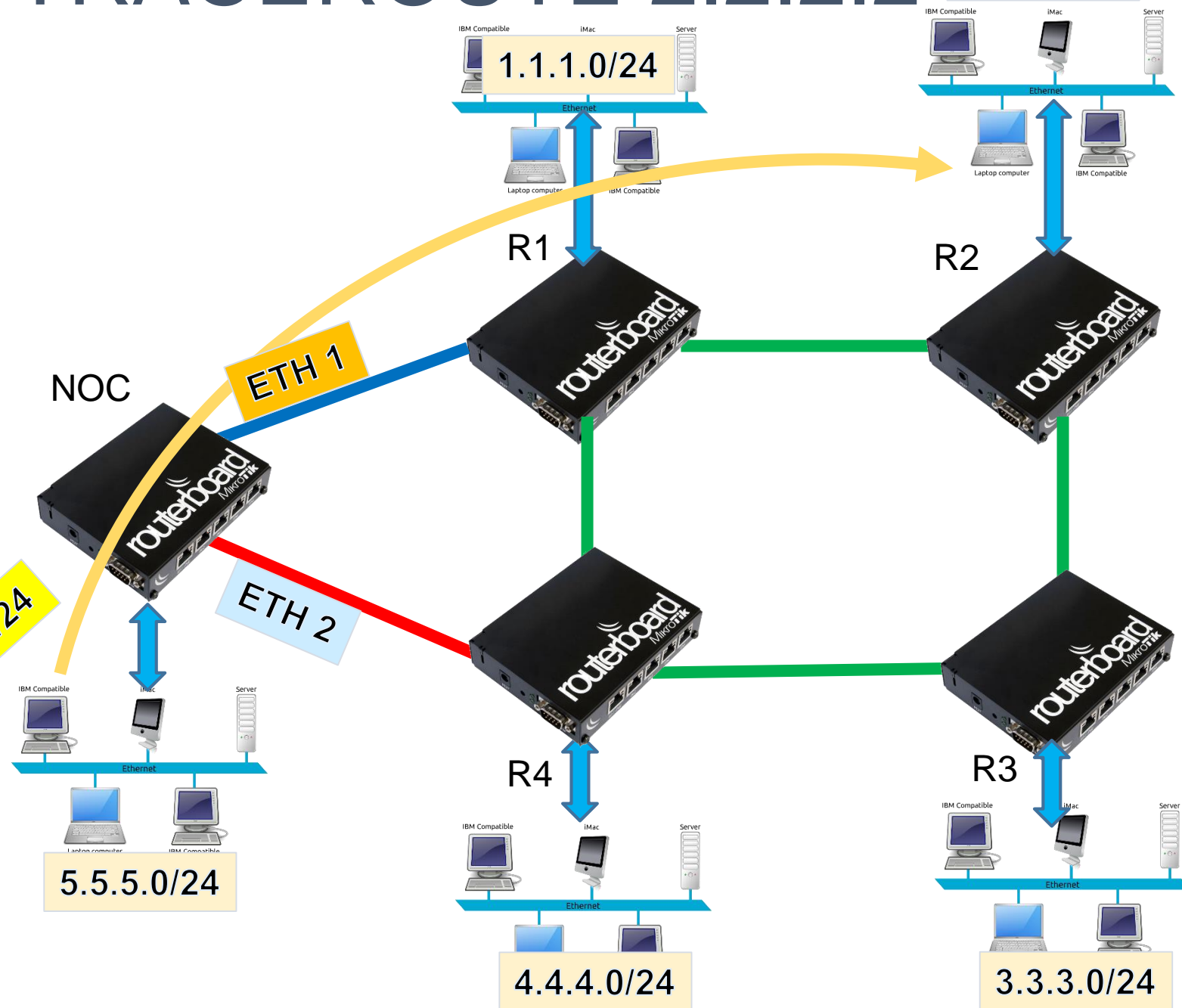
4.4.4.0/24

R2

R3

3.3.3.0/24

Tracroute 2.2.2.0/24



Urutan Prioritas iBGP Parameter

- Next-hop validation
- Highest WEIGHT (default 0)
- **Highest LOCAL-PREF (default 100) ← OUT TRAFFIC**
- Locally originated path (aggregate, BGP network)
- Lowest origin type (IGP,EGP,Incomplete)
- **Lowest MED (default 0) ← IN TRAFFIC**
- Prefer eBGP over iBGP
- Prefer the route with lowest router ID or ORIGINATOR_ID
- Shortest route reflection cluster (default 0)
- Prefer the path that comes from the lowest neighbor address

ROUTE FILTER

Route Filter <2.2.2.0/24>

Matchers BGP Actions BGP Actions

Chain:

Prefix:

Route Filter <2.2.2.0/24>

Matchers BGP Actions BGP Actions

Set BGP Weight:

Set BGP Local Pref.:



BGP Peer <R1>

General Advanced Status

Name:

Instance:

Remote Address:

Remote Port:

Remote AS:

TCP MD5 Key:

Nexthop Choice:

Multihop

Route Reflect

Hold Time:

Keepalive Time:

TTL:

Max Prefix Limit:

Max Prefix Restart Time:

In Filter:

Out Filter:

AllowAS In:

TRACEROUTE 2.2.2.2



Route List					
Routes	Nexthops	Rules	VRF		
+	-	✓	✗	📄	🔍
	Dst. Address	Gateway	Distance	BGP Local Pref.	
Db	▶ 1.1.1.0/24	10.4.0.1 reachable ether2	20		
DAb	▶ 1.1.1.0/24	10.5.0.2 reachable ether1	20		
Db	▶ 2.2.2.0/24	10.5.0.2 reachable ether1	20	50	
DAb	▶ 2.2.2.0/24	10.4.0.1 reachable ether2	20		
Db	▶ 3.3.3.0/24	10.4.0.1 reachable ether2	20		
DAb	▶ 3.3.3.0/24	10.5.0.2 reachable ether1	20		
Db	▶ 4.4.4.0/24	10.4.0.1 reachable ether2	20		
DAb	▶ 4.4.4.0/24	10.5.0.2 reachable ether1	20		
DAC	▶ 5.5.5.0/24	ether3 reachable	0		

Interface List									
Interface	Interface List	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
+	-	✓	✗	📄	🔍				
	Name	Type	Actual MTU	L2 MTU	Tx	Rx			
R	↕LAN	Bridge	1500	65535	0 bps	0 bps			
R	↕LO	Bridge	1500	65535	0 bps	0 bps			
R	↕ether1	Ethernet	1500	1598	0 bps	54.0 Mbps			
R	↕ether2	Ethernet	1500	1598	54.0 Mbps	816 bps			

TEST TRACEROUTE 2.2.2.2

2.2.2.0/24

1.1.1.0/24

2.2.2.0/24

NOC

ETH 1

R1

R2

ETH 2

R4

R3

5.5.5.0/24

5.5.5.0/24

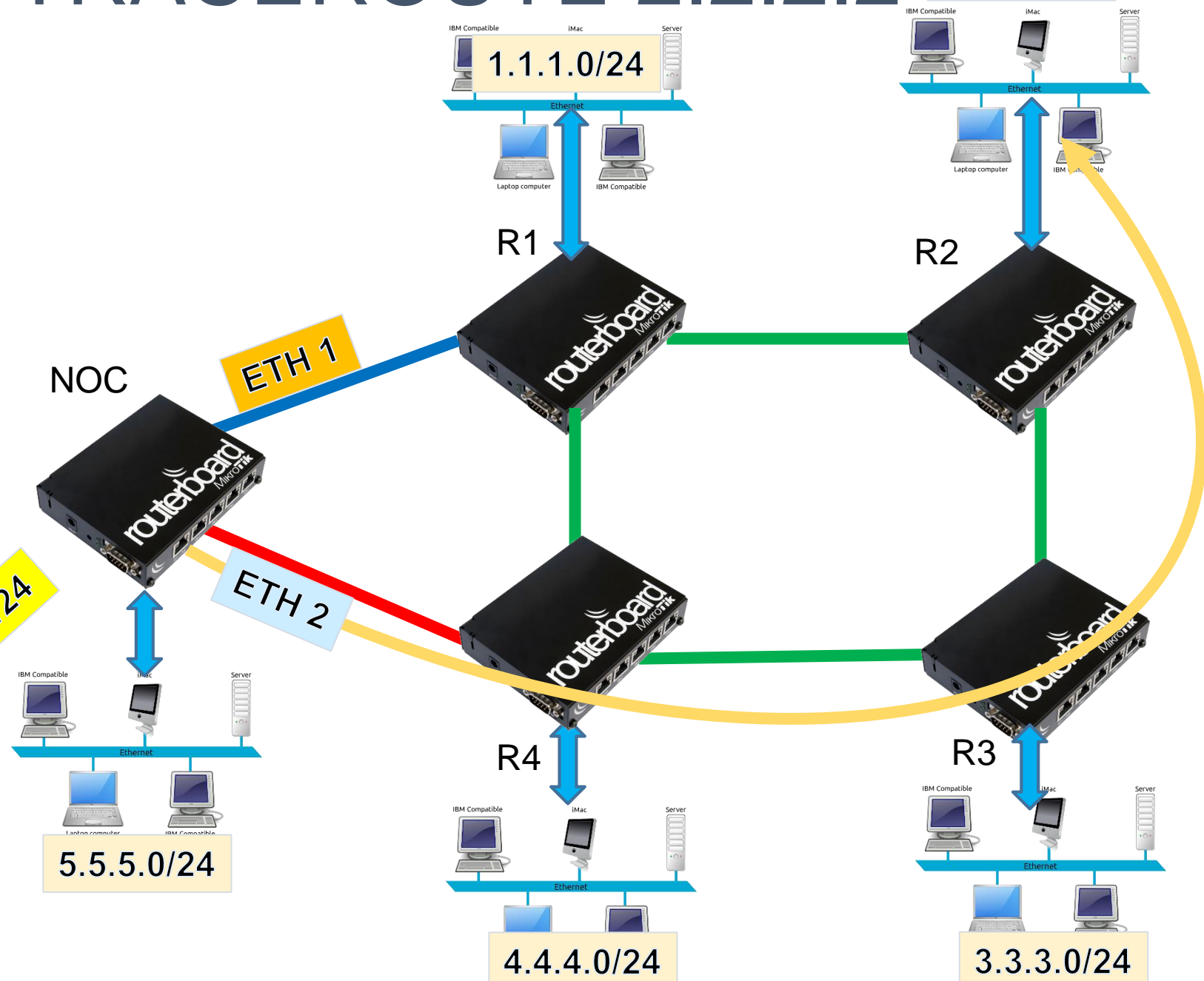
4.4.4.0/24

4.4.4.0/24

3.3.3.0/24

3.3.3.0/24

Tracroute 2.2.2.0/24



UBAH RX 2.2.2.2 via ETHER 2

Route Filter <>

Matchers BGP Actions BGP Actions

Chain: R1-OUT

Prefix:

Route Filter <>

Matchers BGP Actions BGP Actions

Set BGP Weight:

Set BGP Local Pref.:

Set BGP Prepend:

Set BGP Prepend Path:

Set BGP MED: 5

BGP Peer <R1>

General Advanced Status

Name: R1

Instance: default

Remote Address: 10.5.0.2

Remote Port:

Remote AS: 65530

TCP MD5 Key:

Nexthop Choice: default

Multihop

Route Reflect

Hold Time: 180

Keepalive Time:

TTL: default

Max Prefix Limit:

Max Prefix Restart Time:

In Filter: R1-IN

Out Filter: R1-OUT

TRACEROUTE 2.2.2.2

Route List

Routes | Nexthops | Rules | VRF

+ - ✓ ✗ 📄 🏠

	Dst. Address	Gateway	BGP MED
DAb	▶ 1.1.1.0/24	10.10.10.1 recursive via 10.1.0.1 ether2	
DAC	▶ 2.2.2.0/24	LAN reachable	
DAb	▶ 3.3.3.0/24	10.10.10.3 recursive via 10.2.0.2 ether1	
DAb	▶ 4.4.4.0/24	10.10.10.4 recursive via 10.2.0.2 ether1	
Db	▶ 5.5.5.0/24	10.10.10.1 recursive via 10.1.0.1 ether2	5
DAb	▶ 5.5.5.0/24	10.10.10.4 recursive via 10.2.0.2 ether1	



Interface List

Interface | Interface List | Ethernet | EoIP Tunnel | IP Tunnel | GRE Tunnel | VLAN | VRRP | Bonding | LTE

+ - ✓ ✗ 📄 🏠

	Name	Type	Actual MTU	L2 MTU	Tx	Rx
R	LAN	Bridge	1500	65535	0 bps	0 bps
R	LO	Bridge	1500	65535	0 bps	0 bps
R	ether1	Ethernet	1500	1598	0 bps	0 bps
R	ether2	Ethernet	1500	1598	53.3 Mbps	53.5 Mbps

TEST TRACEROUTE 2.2.2.2

2.2.2.0/24

1.1.1.0/24

2.2.2.0/24

NOC

ETH 1

R1

R2

ETH 2

R4

R3

5.5.5.0/24

5.5.5.0/24

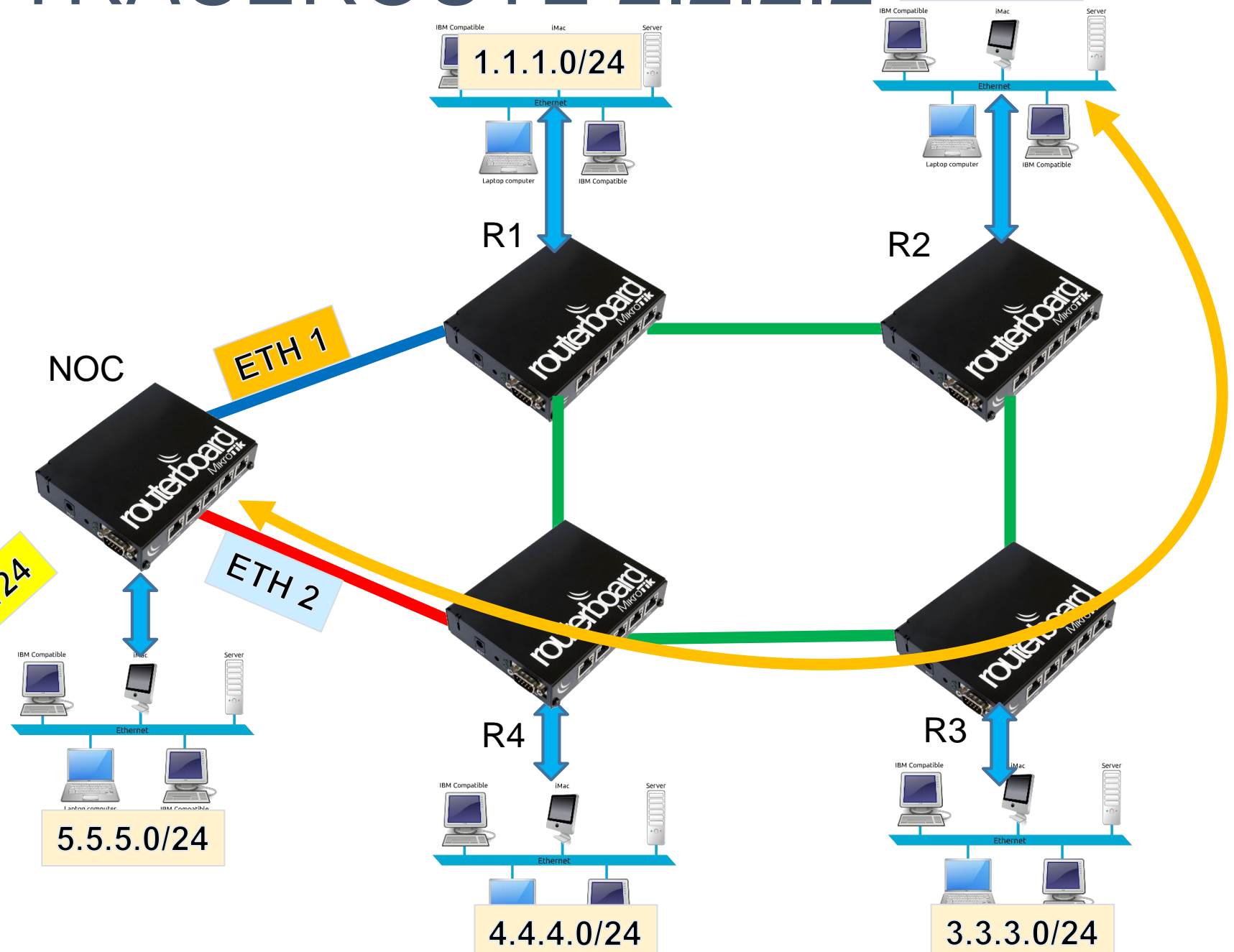
4.4.4.0/24

4.4.4.0/24

3.3.3.0/24

3.3.3.0/24

Tracroute 2.2.2.0/24





THANK YOU

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